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EXAMINER	
MONDT, JOHANNES P	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/898,043	Applicant(s) HAYASHI
	Examiner Johannes P Mondt	Art Unit 2826

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 July 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: .

DETAILED ACTION

Response to Amendment

Amendment A filed 7/29/2 and entered as Paper No. 6 forms the basis of this Office Action. All previously pending claims 1-24 have been substantially amended while new claims 25-37 have been added. Comments on Remarks by Applicant in said Amendment A are included "Response to Arguments" found below and are restricted to those aspects relevant to the present claim set.

Response to Arguments

1. Applicant's arguments filed 7/29/2 have been fully considered but they are not persuasive. In particular,

(A) With regard to the rejection under U.S.C. 35, § 102(b) of claims 1-2: counter to Applicant's allegation that Udagawa does not teach a cladding layer of first conductivity type (the cladding layer formed on said light emitting layer, hence upper cladding layer) an aluminum composition ratio of not more than 0.05, in Example 3 Udagawa does teach an upper cladding layer of first conductivity type with an aluminum composition ratio of 0.05 (cf. column 10, line 30). Therefore, there are two reasons why the traverse of Applicant in this regard is not persuasive: (a) the limitation pertaining to the aluminium composition ratio of the upper cladding layer was not part of the original claim language of claim 1, and (b) Udagawa does teach the aluminum composition ratio to be 0.05, which meets the further limitation inserted into claim 1 in its newly amended form.

(B) With regard to the rejection under U.S.C. 35, § 103(a) of claims 3, 5-10, 12-14, 16-20, and 23-24, Applicant's traverse is based on the misconception that Udagawa does not disclose the aluminum composition ratio for the upper cladding layer, which is incorrect, as shown under (A) above. The thickness range for the upper cladding layer as claimed by Applicant substantially overlaps with that of Udagawa (cf. column 4, lines 14-17), - as already indicated in the previous Office Action, and hence is disclosed by Udagawa. Furthermore, although the examiner agrees with Applicant that the functionalities of optical guide and contact layers are different, something in the claim language would have to make them distinct. There is nothing in claim 14 that precludes the interruption of p-GaN by the material of the cladding layer.

Because the examiner gave the incorrect column and line number with regard to the teaching in Udagawa of the Al composition ratio of the cladding layer, the current Office Action is made non-final.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. ***Claims 1 – 2 and 25 – 26*** *are rejected* under 35 U.S.C. 102(b) as being anticipated by Udagawa (5,886,367). Udagawa teaches a nitride based semiconductor light emitting device comprising:

a light-emitting layer composed of a Group III nitride based semiconductor (cf. abstract, sentence 1) and including an active layer (cf. abstract, sentence 1); and

a cladding layer of a first conductivity type (here selected to be p-type) composed of a Group III nitride based semiconductor (cf. column 4, lines 7-9), formed on said light-emitting layer (cf. abstract, sentence 1), having a larger band gap than said active layer (cf. column 3, line 66 – column 4, line 3), and having a lower refractive index than said active layer (this is so *inherently*, as the refractive index of $Ga_xAl_yIn_{1-x-y(x)}N$ near y=.05 increases as a function of x (see any relevant data series or, for instance, Fig. 3 in "Refractive Index of AlGaInN alloys", T. Peng et al as listed on PTO-892 Form);

the thickness of said cladding layer of first conductivity type being less than 0.3 μm, namely between 0.02 and 0.5 μm (cf. column 4, lines 14-17), and said cladding layer of a first conductivity type has an aluminum composition ratio of 0.05, i.e., of not more than 0.05 (cf. column 10, line 30).

Therefore Udagawa discloses claim 1.

With regard to claim 2: the aluminum composition of said cladding layer in the nitride based semiconductor light-emitting device of claim 1 as anticipated by Udagawa is 0.05 (cf. column 10, line 30). Also, please note that claim 2 does not add any limitation at all to claim 1, and hence cannot be allowed on that ground either.

With regard to claim 25: Udagawa teaches a nitride based semiconductor laser device comprising:

a light emitting layer 107 (cf. column 3, line 60) composed of a Group III nitride based semiconductor and including an active layer 103 (cf. column 3, line 61); and

a cladding layer (cf. column 3, line 54 – column 4, line 30) of a first conduction type (cladding layers inherently are of either n- or p- conduction type) composed of a Group III nitride based semiconductor, formed on said light emitting layer, having a larger band gap than said active layer by virtue of its composition, and having a lower refractive index than the active layer by virtue of its composition, said composition being (Mg-doped) $Al_{0.05}Ga_{0.95}N$, and also inherently so, since cladding layers are designed to have a larger band gap than the active layer in order to promote the absorption of light in said active layer (in addition to providing contact).

the thickness of said cladding layer of a first conduction type being less than 0.3 μm (cf. column 4, lines 16-17).

With regard to claim 26: the nitride based semiconductor laser device as taught by Udagawa has a cladding layer with an aluminum composition ratio of 0.05 (cf. column 10, line 30).

(e) the invention was described in-
(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

3. ***Claims 14, 17-18 and 23-24*** are rejected under 35 U.S.C. 102(e) as being anticipated by Prior Art as Admitted by Applicant.

With regard to claim 14: Prior Art as Admitted by Applicant teaches a nitride based semiconductor light emitting device comprising a light emitting layer 89/88/89 (cf. Figure 8) composed of a Group III nitride based semiconductor and an electrode brought into contact with said light-emitting layer, wherein said light-emitting layer includes an active layer 89 and an optical guide layer 90 of a first conduction type formed on said active layer, said optical guide layer of first conduction type has a larger band gap than said active layer by virtue of its composition (GaN instead of InGaN) and therefore has a lower refractive index than said active layer (see previously given discussion of claim 3 also given again under the rejection of claim 3 as given below), and said electrode is brought into ohmic contact with said optical guide layer through p-AlGaN layer 91 and p-GaN layer 92, said ohmic contact being ensured by the p-conduction type conductivity of said p-AlGaN and p-GaN layers. Therefore, Prior Art as Admitted by Applicant anticipates claim 14.

With regard to claim 17: the Group III nitride based semiconductor in the nitride based semiconductor light emitting device according to claim 14 as taught by Prior Art as Admitted by Applicant contains indium, gallium, and aluminum.

With regard to claim 18: said Group III nitride based semiconductor light emitting device according to claim 14 as taught by the Prior Art as Admitted by Applicant has an active layer of InGaN, hence containing gallium and indium, and the optical guide layer of first conduction type contains gallium (cf. pages 1-15 of disclosure and Figure 8).

With regard to claim 23: first conduction type as taught by Prior Art as admitted by Applicant is p-type (cf. layer 90, Figure 8; pages 1-15; particularly but not exclusively page 2, line 10).

With regard to claim 24: the nitride based semiconductor light emitting device according to claim 14 as taught by the Prior Art as Admitted by Applicant further comprises a cladding layer 84 of second conduction type composed of a Group III nitride based semiconductor, said light emitting layer being formed on said cladding layer of second conduction type.

4. ***Claims 25-27, 30, 32-34, and 36-37*** are rejected under 35 U.S.C. 102(e) as being anticipated by Sverdlov (6,266,355 B1).

With regard to claim 25: Sverdlov (see Figure 1) teaches a nitride based semiconductor laser device comprising:

> a light emitting layer 18/20/22 (cf. column 4, line 9 – column 5, line 19) composed of a Group III nitride based semiconductor (indium gallium nitride) (cf. title and abstract) and including an active layer 20, and a cladding layer 24 of a first conduction type (p-type) composed of a Group III nitride based semiconductor, formed on said light emitting layer, having a larger band gap than said active layer by virtue of its material constitution (GaN; the inclusion of indium in the GaN lowers the band gap energy because In has more atomic shells than Ga; see periodic system; furthermore, it is inherent in cladding layers to have a band gap energy greater than that of the active layer so as to promote absorption in the

active layer rather than in the cladding layer), and having a lower refractive index than the active layer (again a necessary consequence of the material constitution, as discussed above), the thickness of said cladding layer 24 of a first conduction type being in a range that substantially overlaps with the range of claim 25, namely between 0.1 and 0.5 μm (cf. column 5, lines 6-8). In conclusion, Sverdlov anticipates claim 25.

With regard to claim 26: the cladding layer 24 taught by Sverdlov has 0 aluminum composition ratio, which is not more than 0.05 (cf. abstract and column 4, line 58 – column 5, line 19).

With regard to claim 27: said light emitting layer as taught by Sverdlov further includes an optical guide layer of first conductivity type (p-type here) 22 for gathering electrons and holes and leading or guiding them to the active layer (cf. column 4, line 9 – column 5, line 19), and by virtue of having an indium composition ratio that is intermediate between that of the active layer and that of the cladding layer (y>x, see column 4, line 9 – column 5, line 19), said optical guide layer of first conduction type 24 has a smaller band gap and higher refractive index than said cladding layer of first conduction type and a larger band gap and lower refractive index than said active layer, while said cladding layer is formed on said optical guide layer of a first conduction type.

With regard to claim 30: the Group III nitride based semiconductor as taught by Sverdlov contains gallium (cf. column 2, lines 40-67).

With regard to claim 32: said active layer as taught by Sverdlov contains gallium and indium (cf. column 2, lines 40-67).

With regard to claim 33: said active layer as taught by Sverdlov has a multi-quantum well structure (cf. Figure 3 and column 4, line 64 – column 5, line 19), while inherent to the concept of multiple quantum well structure is the alternate inclusion of one or more well layers as active layers and a plurality quantum barrier layers (cf. column 4, line 65 – column 5, line 3), as a necessary logical consequence of which the band gap of the active layer is the band gap of said one or more well layers.

With regard to claim 34: it is understood in the art of semiconductor laser devices that the electric field distribution of laser light in the active layer is changed, i.e., has a time dependence, in accordance with a sine or cosine function because coherent light is activated within said active layer; and that the electric field of laser light in the cladding layer of a first conduction type is changed in accordance with an exponential function, as light is not activated but instead partly absorbed in said cladding layer. Therefore, the further limitation of claim 34 does not distinguish over the prior art.

With regard to claim 36: the first conduction type of the cladding layer 24 of claim 25 as taught by Sverdlov is p type, as already mentioned.

With regard to claim 37: the nitride based semiconductor laser device of claim 25 as taught by Sverdlov further comprises a cladding layer 16 of second conduction type (n-type) 16 (cf. column 4, line 14) composed of a Group III nitride

based semiconductor, namely GaN, said light emitting layer is formed on said cladding layer of second conduction type (cf. Figure 1).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. ***Claims 3, 5 – 10, 12 – 13** are rejected* under 35 U.S.C. 103(a) as being unpatentable over Udagawa (5,886,367) in view of Prior Art as admitted by Applicant in the disclosure of his invention. As detailed above, Udagawa anticipates claim 1 (on which claim 3 depends). Udagawa does not necessarily disclose the further limitation of claim 3. However, the nitride based semiconductor light-emitting device admitted as Prior Art by Applicants (Fig. 8 and page 2, lines 7-11) has a light emitting layer 89 with optical guide layer 90 of first conductivity type (p-type) (cf. page 2, line 10) formed on said active layer for the obvious purpose of providing confinement, said optical guide layer of first conductivity type having a smaller band gap and higher refractive index than said cladding layer (*inherently so,* as said optical guide layer is formed of p-GaN, with band gap equal to 3.4 eV and refractive index at standard blue of 2.41; while the cladding layer for Aluminum content 0.05 (for instance) has a band gap of 3.51 eV and refractive index at standard blue well approximated by linear extrapolation (dashed and

solid curves being close in Fig. 3 of Peng et al, loc. cit., and hence considerably lower than that of GaN as the index of refraction of AlN is lower than that of GaN (see Table 1 of Peng et al, loc. cit.)) while said optical guide layer has a larger band gap and lower refractive index (at standard blue) than said active layer (*inherently so*, because for the same reasons quoted above, the energy band gap of GaN being larger than that of $Al_xGa_yIn_{1-x-y}N$ (cf. column 3, lines 62-65) for some values in the range of the invention taught by Udagawa, considering that the band gap of InN is considerably lower than that of GaN, having the largest lattice constant (Table 1 of Peng et al) while, on the other hand, the refractive index of InN is very high, cf. Fig. 1)); said cladding layer of the first conductivity type being formed on said optical guide layer of first conductivity type.

Therefore, it would have been obvious to one of ordinary skills in the art to modify the invention by Udagawa so as to include the further limitation of claim 3.

With regard to claim 5: Prior Art as admitted by Applicants features a ridge portion of the upper cladding layer (first conductivity type or p-type) (cf. Fig. 8) for enhanced luminous efficiency. Therefore, the further limitation of claim 5 does not distinguish over the Prior Art.

With regard to claim 6: Udagawa teaches the said Group III nitride based semiconductor to contain gallium, as well as aluminum and indium (cf. abstract, sentence 1). Therefore, the further limitation defined by claim 6 does not distinguish over the cited prior art.

With regard to claim 7: Udagawa teaches the cladding layer of first conductivity type to contain aluminum and gallium (cf. column 4, lines 7-9). Therefore, the further limitation defined by claim 7 does not distinguish over the cited prior art.

With regard to claim 8: Udagawa teaches the active layer to contain both gallium and indium (cf. abstract, sentence 1). Therefore, the further limitation defined by claim 8 does not distinguish over the cited prior art.

With regard to claim 9: although Udagawa does not necessarily teach the further limitation as defined by claim 9, the use of Multiple Quantum Wells (inherently including one or more well layers with quantum barrier layers) is standard in the art of semiconductor light-emitting devices, as witnessed for instance by the Prior Art as admitted by Applicant in the disclosure, teaching a Multiple Quantum Well 89 (cf. Fig. 8 and page 2, lines 8-9). Multiple Quantum Wells offer the advantage of increased gain coupling coefficient, which is an immediate advantage also for the invention by Udagawa. Therefore, it would have been obvious to one of ordinary skills in the art to modify the invention by Udagawa so as to include the further limitation as it has been defined by claim 9.

With regard to claim 10: it is inherent to a laser cavity and its immediate surrounding layers that the laser field amplitude is oscillatory within said cavity (here the MQW) and exponential outside of it, in the surrounding layers. Therefore, the further limitation as defined by claim 10 does not distinguish over the prior art.

With regard to claim 12: the first conductivity type in Udagawa is p-type, as already mentioned. Therefore, the further limitation as defined by claim 12 does not distinguish over the prior art.

With regard to claim 13: Udagawa teaches a (lower) cladding layer 103 of conductivity type opposite to said upper cladding layer 105 (cf. column 3, lines 60-62 and column 4, lines 12-14), hence of second conductivity type, and composed of a Group III nitride based semiconductor (cf. column 4, lines 7-9) with said light-emitting or active layer 104 (cf. column 3, line 62) being formed on said lower cladding layer 103 of second conductivity type. Therefore, the further limitation as defined by claim 13 does not distinguish over the prior art.

With regard to claim 14: Udagawa teaches a nitride based semiconductor light emitting device comprising a light emitting layer composed of a Group III nitride based semiconductor (cf. column 3, lines 62-65) and an electrode brought into contact with said light emitting layer, wherein said light emitting layer includes and an active layer (cf. column 3, lines 62-65). Udagawa does not necessarily disclose the further limitation as defined by claim 14 that said light emitting layer in said nitride based semiconductor light emitting device also includes an optical guide layer with properties and relation to an electrode as delineated in claim 14. However, the physical constitutions of the optical guide layer 90 and of the contact layer 92 (in electrical contact with p-side electrode 131) in the Prior Art as admitted by Applicants are identically the same: p-GaN (cf. page 2, lines 10-13). Therefore, their implied functional potentials are the same, while it is an obvious advantage to use as optical guide layer a layer that also can function as contact

layer, which advantage naturally applies equally to the invention taught by Udagawa as confinement is a general advantage in the art of light-emitting semiconductor devices. Furthermore, layer 92 is formed on the active layer 89, while by virtue of its constitution it has a larger band gap and lower refractive index than the active layer (please be referred to the discussion of claim 3 as detailed above).

With regard to claim 16: Prior Art as admitted by Applicants show the optical guide layer 92 of first conductivity type (p-GaN) to have a ridged portion and said electrode 131 is brought in ohmic contact with an upper face of 92. Therefore, the further limitation defined by claim 16 does not distinguish over the prior art.

With regard to claim 17: the Group III nitride based semiconductor of Udagawa contains gallium, aluminum, and indium (cf. column 3, lines 62-65).

With regard to claim 18: Udagawa teaches the active layer to contain gallium and indium (cf. column 3, lines 62-65), while the optical guide layer 90 taught by Prior Art as admitted by Applicant contains gallium (cf. page 2, lines 10-11), which is an obvious material choice, considering the occurrence of GaN based layers in the device, and said selection is equally obvious for Udagawa's device for the same reason. Therefore, it would have been obvious to one of ordinary skills in the art to modify the invention as defined by claim 14 at the time it was made so as to include the further limitation of claim 18.

With regard to claim 19: although Udagawa does not necessarily teach the further limitation as defined by claim 19, the use of Multiple Quantum Wells (inherently including one or more well layers with quantum barrier layers) is standard in the art of

semiconductor light-emitting devices, as witnessed for instance by the Prior Art as admitted by Applicant in the disclosure, teaching a Multiple Quantum Well 89 (cf. Fig. 8 and page 2, lines 8-9). Multiple Quantum Wells offer the advantage of increased gain coupling coefficient, which is an immediate advantage also for the invention by Udagawa. Therefore, it would have been obvious to one of ordinary skills in the art to modify the invention by Udagawa so as to include the further limitation as it has been defined by claim 19.

With regard to claim 20: it is inherent to a laser cavity and its immediate surrounding layers that the laser field amplitude is oscillatory within said cavity (here the MQW) and exponential outside of it, in the surrounding layers. Therefore, the further limitation as defined by claim 20 does not distinguish over the prior art.

7. ***Claims 4, 15, and 21*** *are rejected* under 35 U.S.C. 103(a) as being unpatentable over Udagawa and Prior Art as admitted by Applicant as applied to claim 3 above, and further in view of Steigerwald (JOM, volume 49, issue 9, pp. 18-23 (1997)).

Neither Udagawa nor Prior Art as admitted by Applicant necessarily teaches the further limitation as defined by claim 4. However, the application of a carrier leakage preventing layer of first conductivity type formed on said active layer and having a larger band gap than said optical guide layer of first conductivity type is standard in the industry, as witnessed by Steigerwald et al, who show (cf. Fig. 5) the Nichia Company's Blue Light-Emitting device with a layer formed of p-type $Al_{0.2}Ga_{0.8}N$ interposed between a multiple quantum well and the p-GaN optical guide layer. Therefore, it would have

been obvious to one of ordinary skills in the art to modify the invention as defined by claim 3 so as to include the further limitation as defined by claim 4.

With regard to claim 15: Neither Udagawa nor Prior Art as admitted by Applicant necessarily teaches the further limitation as defined by claim 15. However, the application of a carrier leakage preventing layer of first conductivity type formed on said active layer and having a larger band gap than said optical guide layer of first conductivity type is standard in the industry, as witnessed by Steigerwald et al, who show (cf. Fig. 5) the Nichia Company's Blue Light-Emitting device with a layer formed of p-type $Al_{0.2}Ga_{0.8}N$ interposed between a multiple quantum well and the p-GaN optical guide layer. Therefore, it would have been obvious to one of ordinary skills in the art to modify the invention as defined by claim 15 so as to include the further limitation as defined by claim 15.

With regard to claim 21: the active layer in Udagawa, as well as in Prior Art as admitted by Applicants, as well as in Steigerwald, contains gallium and indium; said optical layer as taught in the Prior Art (and Steigerwald, see Fig. 5) as admitted by Applicants contains gallium; and said carrier leakage preventing layer of first conductivity type as shown in Steigerwald (Fig. 5) contains gallium and aluminum. Therefore, the further limitations as defined by claim 21 do not distinguish over the cited prior art.

8. ***Claim 11** is rejected* under 35 U.S.C. 103(a) as being unpatentable over Udagawa (5,886,367) in view of Hashimoto et al (6,096,394). Udagawa does not

necessarily teach the further limitation of claim 11. However, the use of current-blocking layers formed on or in the upper cladding layer (i.e., said cladding layer of first conductivity type, p-type here) with a striped opening *for the purpose* of limiting the current flow to the active layer is standard in the art of Group III light emitting diodes as witnessed for instance by Hashimoto et al (cf. Fig. 12) who teach a current-blocking layer 46 with stripe-shaped window 46a buried in the upper cladding layer 47 (cf. column 17, lines 31-34). Said purpose is equally valid for the present invention, generic as it is to all light-emitting diodes to enhance efficiency. Therefore, it would have been obvious to one of ordinary skills in the art to modify the invention by Udagawa at the time it was made so as to include the further limitation of claim 11.

9. ***Claim 22*** *is rejected* under 35 U.S.C. 103(a) as being unpatentable over Udagawa and Prior Art as admitted by Applicants in the disclosure as applied to claim 14 above, and further in view of Hashimoto et al (6,069,394); or, in the alternative, over Prior Art as admitted by Applicant in view of Hashimoto et al (6,069,394). As detailed above, claim 14 is unpatentable over Udagawa in view of Prior Art as admitted by Applicants, and, in the alternative, by Prior Art as Admitted by Applicant. Neither Udagawa nor Prior Art as admitted by Applicants necessarily disclose the further limitation of claim 22. However, the use of current-blocking layers formed on or in the upper cladding layer (i.e., said cladding layer of first conductivity type, p-type here) with a striped opening *for the purpose* of limiting the current flow to the active layer is standard in the art of Group III light emitting diodes as witnessed for instance by

Hashimoto et al (cf. Fig. 12) who teach a current-blocking layer 46 with stripe-shaped window 46a buried in the upper cladding layer 47 (cf. column 17, lines 31-34). Said purpose is equally valid for the present invention, generic as it is to all light-emitting diodes to enhance efficiency. Therefore, it would have been obvious to one of ordinary skills in the art to modify the invention by Udagawa at the time it was made so as to include the further limitation of claim 22.

10. ***Claim 28*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Sverdlov (6,266,355 B1) in view of Steigerwald (JOM, volume 49, issue 9, pp. 18-23 (1997)).

As detailed above, Sverdlov anticipates claim 25.

Sverdlov does not necessarily teach the further limitation as defined by claim 27. However, the application of a carrier leakage preventing layer of first conductivity type formed on said active layer and having a larger band gap than said optical guide layer of first conductivity type is standard in the industry, as witnessed by Steigerwald et al, who show (cf. Fig. 5) the Nichia Company's Blue Light-Emitting device with a layer formed of p-type $Al_{0.2}Ga_{0.8}N$ interposed between a multiple quantum well and the p-GaN optical guide layer.

Therefore, it would have been obvious to one of ordinary skills in the art to modify the invention as defined by claim 27 so as to include the further limitation as defined by claim 28.

11. ***Claim 29*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Sverdlov (6,266,355 B1) in view of Tanaka et al (4,961,197). As detailed above, Sverdlov anticipates claim 25. Sverdlov does not necessarily teach the further limitation defined by claim 29. However, it has long been known in the art of Group III-V semiconductor light-emitting devices to include a ridge portion of several tenths of micron thickness in the upper cladding layer to increase light emission efficiency, as witnessed by Tanaka et al (cf. column 10, line 62 – column 11, line 24). Although the ridge thickness taught by Tanaka is 0.7 μm and not 0.3 μm as required for the present claim, Applicant does not show the range defined by claim 29 to be critical to the invention. Applicant is reminded that it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

12. ***Claim 31*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Sverdlov (6,266,355 B1) in view of Bour (5,812,576) and Chen et al (6,177,359 B1). As detailed above, Sverdlov anticipates claim 25. Sverdlov does not necessarily teach the further limitation defined by claim 31. However, if it were not for considerations of method of making, AlGaN (greater band gap), is preferable, as admitted by Sverdlov (cf. abstract, a/o), and the only reason Sverdlov departs from the commonly chosen structure including AlGaN cladding layers 104 and 108 as taught by Bour (cf. Figure 1) for the same device as Sverdlov, i.e., nitride based semiconductor laser with InGaN active layer (cf. title, abstract and column 1) is the avoidance of the need to apply heat

that affects the underlying InGaN layers; however, as taught by Chen et al, epitaxially grown layers such as the upper AlGaN cladding layer 108 of Bour (cf. Bour, column 5, line 35), can be easily detached from the substrate and transferred to another substrate without loss of optical properties (cf. abstract, final sentence). Motivation to include the teachings in this regard by Bour and Chen et al is the achievement of higher band gap cladding material without compromising the integrity of the underlying light-emitting layer when applied to the invention of Sverdlov. The inventions can be easily combined, because the method of growing the cladding layer 108 epitaxially on a separate substrate after which said cladding layer is transferred to be become layer 24 placed on top and in direct contact with layer 22 does not interfere with any of the other steps in the method of making the superior device. Success in implementing the combination can therefore be reasonably expected.

13. ***Claim 35*** is rejected under 35 U.S.C. 103(a) as being unpatentable over Sverdlov (6,266,355 B1) in view of Tanaka et al (5,974,069). As detailed above, Sverdlov anticipates claim 25. Sverdlov does not necessarily disclose the further limitation as defined by claim 35. However, the use of current blocking layers in the art of nitride based semiconductor laser devices for the specific purpose to improve light emitting efficiency has long been known, as evidenced by Tanaka et al, who teach (cf. Figure 1) the nitride based semiconductor laser device to comprise a current blocking layer (cf. column 12, line 60 – column 13, line 28) formed on the upper cladding layer 5

(cf. column 12, line 60 – column 13, line 40) and having a striped opening (cf. column 12, line 60 – column 13, line 40).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is 703-306-0531. The examiner can normally be reached on 8:00 - 18:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on 703-308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

JPM
October 14, 2002

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